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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

03 JUN 2005

Applicant's or agent's file reference CH920030007	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB 03/05128	International filing date *(day/month/year)* 13.11.2003	Priority date *(day/month/year)* 05.12.2002
International Patent Classification (IPC) or both national classification and IPC B01L3/00		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
24.06.2004	18.03.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Tiede, R Telephone No. +31 70 340-1090

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB 03/05128

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-27	as originally filed

Claims, Numbers

28-43	as originally filed
1-27	received on 24.06.2004 with letter of 21.06.2004

Drawings, Sheets

1/4-4/4	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☒ the claims, Nos.: 28-43

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-27
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-27
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-27
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: WO 99/56878 A (VETTER DIRK ;GRAFFINITY PHARMACEUTICAL DESI (DE); SCHMIDT KRISTINA) 11 November 1999 (1999-11-11)

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):
A device comprising for bringing a liquid to said substrate (page 4 and 5, fig. 1).
The subject-matter of claim 1 differs from this known device in that the outer sides of the conduits, which limit the end surface of the protrusion are of limited wettability while the end surface itself is wettable by said liquid.
This makes smaller recesses possible and thus improves such devices. No incentive could be found in D1 to limit the liquid by a superposing geometrical and wettability patterns.
Subject-matter of claim 1 is therefore novel and inventive (Article 33 PCT).

Claims 2-27 comprise all technical features of claim 1. They are therefore equally novel and inventive (Article 33 PCT).

CLAIMS

1. A device for applying a liquid to a substrate surface, the device comprising a chamber for carrying the liquid, an aperture in the chamber for communicating liquid from the chamber to the substrate surface via a conduit having outer sides of limited wettability to the liquid.

2. A device as claimed in claim 1, having a body including a protrusion defined by the outer sides of the conduit.

3. A device as claimed in claim 1, wherein the conduit comprises inner sides wettable by the liquid.

4. A device as claimed in any preceding claim, wherein the body comprises a plane inner surface surrounding the protrusion and a plane outer surface parallel to, offset from, and surrounding the inner surface, the protrusion extending from the inner surface and having an end coplanar with outer surface.

5. A device as claimed in claim 4, wherein the inner surface forms a peripheral recess surrounding the protrusion.

6. A device as claimed in claim 4, wherein the outer surface is of limited wettability to the liquid.

7. A device as claimed in claim 4, wherein the end of the protrusion is wettable by the liquid.

8. A device as claimed in claim 1, comprising: a first chamber for carrying the liquid; a second chamber for carrying the liquid; a first aperture in the first chamber for communicating liquid from the first chamber to the substrate surface via a first conduit having outer sides of limited wettability to the liquid; and, a second aperture in the second chamber for communicating liquid from the second

chamber to the substrate surface via a second conduit having outer sides of limited wettability to the liquid.

9. A device as claimed in claimed in claim 8, having a body including a protrusion defined by the outer sides of the first and second conduits.

10. A device as claimed in claim 8 or claim 9, wherein the first and second conduits comprise inner sides wettable by the liquid.

11. A device as claimed in any of claims 8 to 10, wherein the body comprises a plane inner surface surrounding the protrusion and a plane outer surface parallel to, offset from, and surrounding the inner surface, the protrusion extending from the inner surface and having an end coplanar with outer surface.

12. A device as claimed in claim 11, wherein the inner surface forms a peripheral recess surrounding the protrusion.

13. A device as claimed in claim 11, wherein the outer surface is of limited wettability to the liquid.

14. A device as claimed in claim 11, wherein the end of the protrusion is wettable by the liquid.

15. A device as claimed in claim 14, wherein the end of the protrusion comprises a flow path extending from the first aperture to the second aperture.

16. A device as claimed in claim 15, wherein: the first chamber has a first pressure for retaining the liquid when the flow path is remote from the substrate surface; the second chamber has a second pressure such that the difference between the first and second pressures is oriented to promote flow of the liquid from the first chamber to the second chamber via the flow path in response to the flow path being located

proximal to the substrate surface and the liquid in the device contacting the substrate surface; and, the first and second pressures are such that the liquid is drawn towards at least the second chamber in response to withdrawal of the flow path from the substrate surface.

17. A device as claimed in claim 16, wherein at least one of the first chamber and the second chamber comprises a capillary network for applying pressure to the liquid.

18. A device as claimed in claim 17, wherein the or each capillary network comprises at least one of a plurality of parallel capillary members, a mesh, a porous material, and a fibrous material.

19. A device as claimed in any of claims 15 to 18, comprising a plurality of first chambers each coupled to the flow path.

20. A device as claimed in any of claims 15 to 19, comprising a plurality of second chambers each coupled to the flow path.

21. A device as claimed in any of claims 15 to 20 wherein the flow path has one of a curved cross section and a rectangular cross section.

22. A device as claimed in any of claims 15 to 21, wherein the first and second pressures are such that the liquid is drawn towards the first chamber and the second chamber in response to withdrawal of the flow path from the substrate surface.

23. A device as claimed in any of claims 15 to 22, wherein the second aperture surrounds the first aperture.

24. A device as claimed in any preceding claim of unitary construction.

25. A device as claimed in claim 24, formed from any one of polymer, glass, silicon, SU-8, photoresist, thermoplastic, ceramic, and metal.

26. A device as claimed in any claim preceding claim 24 of layered construction.

27. A device as claimed in claim 26, wherein each layer is formed from one of polymer, glass, silicon, SU-8, photoresist, thermoplastic, metal, and ceramics.

28. An array of devices each as claimed in any preceding claim.

29. A method for applying a liquid to a substrate surface, the method comprising: locating a device as claimed in any of claims 1 to 14 proximal to the substrate surface; supplying the liquid to the substrate surface via the device; and, retracting the device from the substrate surface.

30. A method for applying a liquid to a substrate surface, the method comprising: locating a device as claimed in any of claims 15 to 23 proximal to the substrate surface; supplying the liquid to the substrate surface via the device; flowing the liquid from the first chamber to the second chamber via the flow path; and, retracting the device from the substrate surface.

31. A method as claimed in claim 30, further comprising varying the flow of the liquid from the first chamber to the second chamber during the supply of the liquid to the surface.

32. A method as claimed in claim 29 to 31, further comprising: prior to the retracting, moving the device relative to the substrate surface with the liquid in the or each aperture contacting with the substrate surface.

33. A method for applying a liquid to a substrate surface, the method comprising: locating a device as claimed in any of claims 8 to 14 proximal to the substrate surface; supplying the liquid to the substrate surface via the device; moving the device relative to the substrate surface with the liquid in the apertures contacting with the substrate surface; and, retracting the device from the substrate surface.

34. A method as claimed in claim 33, comprising orienting the device relative to the substrate surface such that traces of the liquid produced as the device is moved relative to the substrate surface remain separate.

35. A method as claimed in claim 33, comprising orienting the device relative to the substrate surface such that traces of the liquid produced as the device is moved relative to the substrate surface overlap.

36. A method as claimed in any of claims 33 to 35, further comprising, prior to locating, loading a similar liquid into the first and second chambers.

37. A method as claimed in any of claims 33 to 35, further comprising, prior to locating, loading different liquids into the first and second chambers.

38. A method for applying a liquid to a substrate surface, the method comprising: locating an array of devices as claimed in any of claims 15 to 22 proximal to the substrate surface; supplying the liquid to the substrate surface via the array; in each device of the array, flowing the liquid from the first chamber to the second chamber via the flow path; moving the array relative to the substrate surface with the liquid in each aperture contacting with the substrate surface; and, retracting the array from the substrate surface.

39. A method as claimed in claim 38, further comprising, in at least one device of the array, varying the flow of the

liquid from the first chamber to the second chamber during the supply of the liquid to the surface.

40. A method as claimed in claim 38 or claim 39, comprising orienting the array relative to the substrate surface such that traces of the flows of liquid produced as the array is moved relative to the substrate surface remain separate.

41. A method as claimed in claim 38 or claim 39, comprising orienting the array relative to the substrate surface such that traces of the flows of liquid produced as the array is moved relative to the substrate surface overlap.

42. A method as claimed in any of claims 38 to 41, further comprising, prior to locating, loading a similar liquid into each device of the array.

43. A method as claimed in any of claims 38 to 41, further comprising, prior to locating, loading different liquids into each device of the array.